252d Film Coating of Ultrafine Cohesive Particles through Innovative Approaches

Jun Yang, Yuhua Chen, Yueyang Shen, Jose A. Quevedo, Rajesh Dave, and Robert Pfeffer

Coating of ultrafine particles has been a significant challenge. There are various ways in which cohesive particle may be coated, but there are significant problems such as use of excessive amount of solvent, unavoidable agglomeration, and cost. In this work, a number of approaches are considered to coat particles ranging from few nano meters (20 nm and up) to few microns. The techniques developed in our work can be loosely classified into two categories, supercritical fluid (SCF) based processing and fluidization based processing. A brief review of our previous research in SCF based coating will be provided along with a summary of new results. It is found that SCF based methods are very suitable for nano and sub-micron particles. On the other hand, for particles of several microns up to 20-30 microns can be coated through novel fluidization based devices. The major emphasis of this presentation is on novel approaches based on fluidization, both conventional (including wurster coaters such as Mini-Glatt device) and rotating (i.e. centrifugal) fluidized beds. Several types of fine powders are considered, including energetic material simulants, drug/food and other organic materials, and metal powders. Various polymers are also considered as coating materials, including biodegradable polymers as well as commercial polymers. Electron micrography techniques (FESEM and TEM) are used to characterize the particles before and after coating. It is shown that all of these techniques are capable of coating fine particles, but each one has a different set of advantages and disadvantages. Relative merits of these methods are discussed.